On the nature of voicing assimilation(s)

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Overview

- Review of 4 production experiments concerning regressive voicing assimilation (RVA) in Hungarian, English, and Dutch:

  Experiment 1 Hungarian 2–way clusters
  Experiment 2 English 2–way clusters
  Experiment 3 Hungarian 3–way clusters
  Experiment 4 Dutch 3–way clusters

- Discussion of results in light of textbook accounts of RVA and (time permitting) recent instrumental work on sandhi processes

Motivation

- Phonological voicing in obstruents is realised by a complex of phonetic cues, including (the timing of) low frequency periodicity, duration, burst/frication intensity
- This implies that the phonetic reflexes of voicing assimilation should provide a good testbed for hypotheses surrounding the nature of sandhi processes
- . . . and in particular for claims concerning
  - categorical–phonological vs.
  - coarticulatory models of sandhi processes

Motivation

- Two pieces of evidence suggesting voicing assimilation under word sandhi is at least rooted in coarticulation:
  1. Descriptions in the literature of VA being restricted to phonetic voicing or otherwise applying as a low-level process
  2. Assimilation to phonologically [+voice] plosives only seems to occur in languages where such plosives are (canonically) prevoiced

The experiments

- Rationale for choice of languages: cross–classification of RVA and Final Laryngeal Neutralisation, at least to standard phonological typologies (e.g. Lombardi 1995, 1999):

	Neutralisation	Assimilation
Dutch	Yes	Yes
(German)	Yes	No
Hungarian	No	Yes
English	No	No

Experiment 1

- Hungarian is usually described as exhibiting (categorical) RVA in all underlying [αvoice][$-\alpha$voice] sequences (cf. Siptár & Törkenczy 2000):

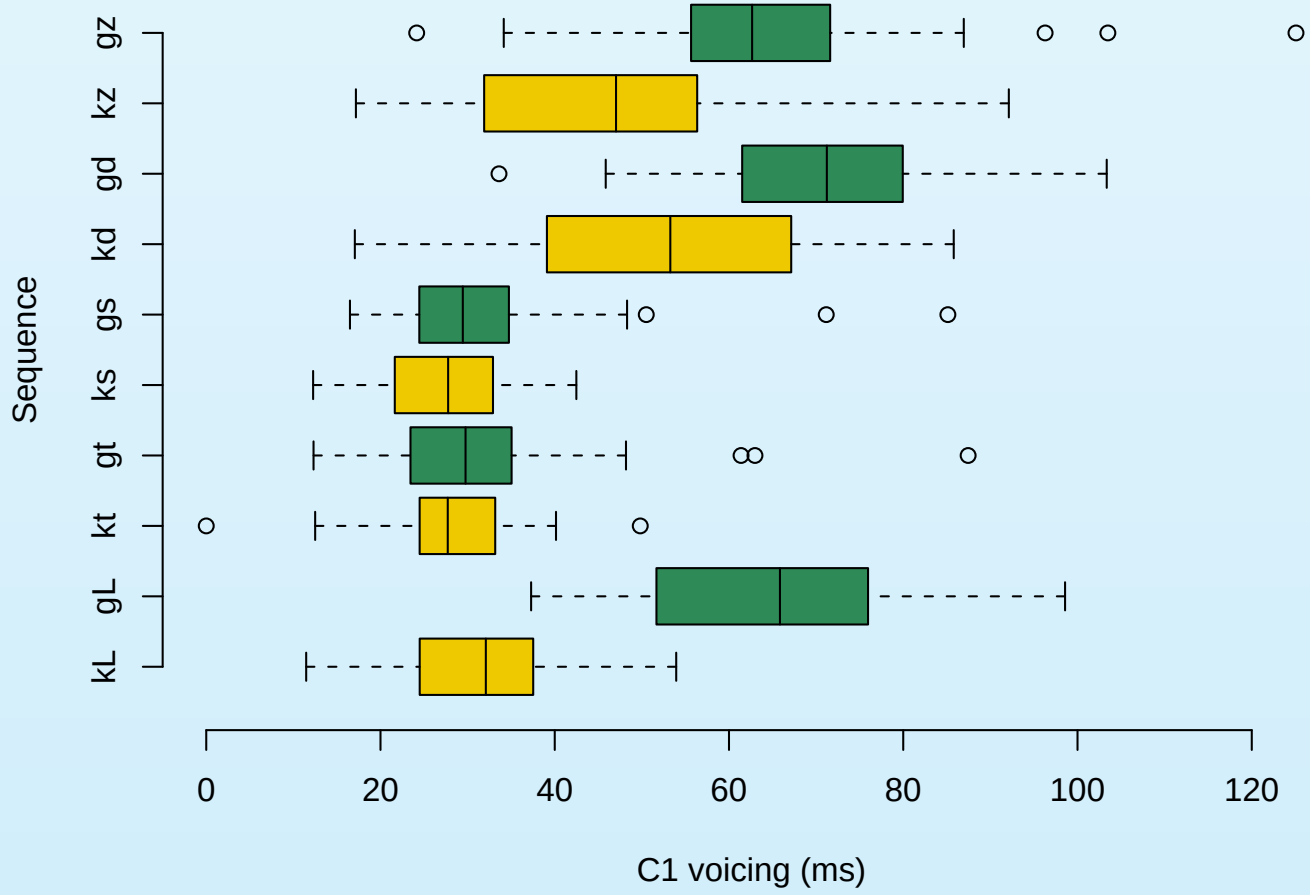
/kɔlɔp/+ /bɔn/	[kɔlɔbːɔn]	‘in (a) hat’
/fyːc/+ /bɔn/	[fyːɟbɛn]	‘in (a) whistle’
/seːp/+ /zɛneːs/	[seːbzɛneːs]	‘beautiful musician’
/vɔk/+ /zɛneːs/	[vɔgzɛneːs]	‘blind musician’
/rɔb/+ /toːl/	[rɔptoːl]	‘from (a) prisoner’
/aːɟ/+ /toːl/	[aːctoːl]	‘from (a) bed’
/hɔb/+ /sifon/	[hɔpsifon]	‘cream-maker’
/hɔd/+ /ʃɛrɛg/	[hɔtʃɛrɛg]	‘army’

Experiment 1

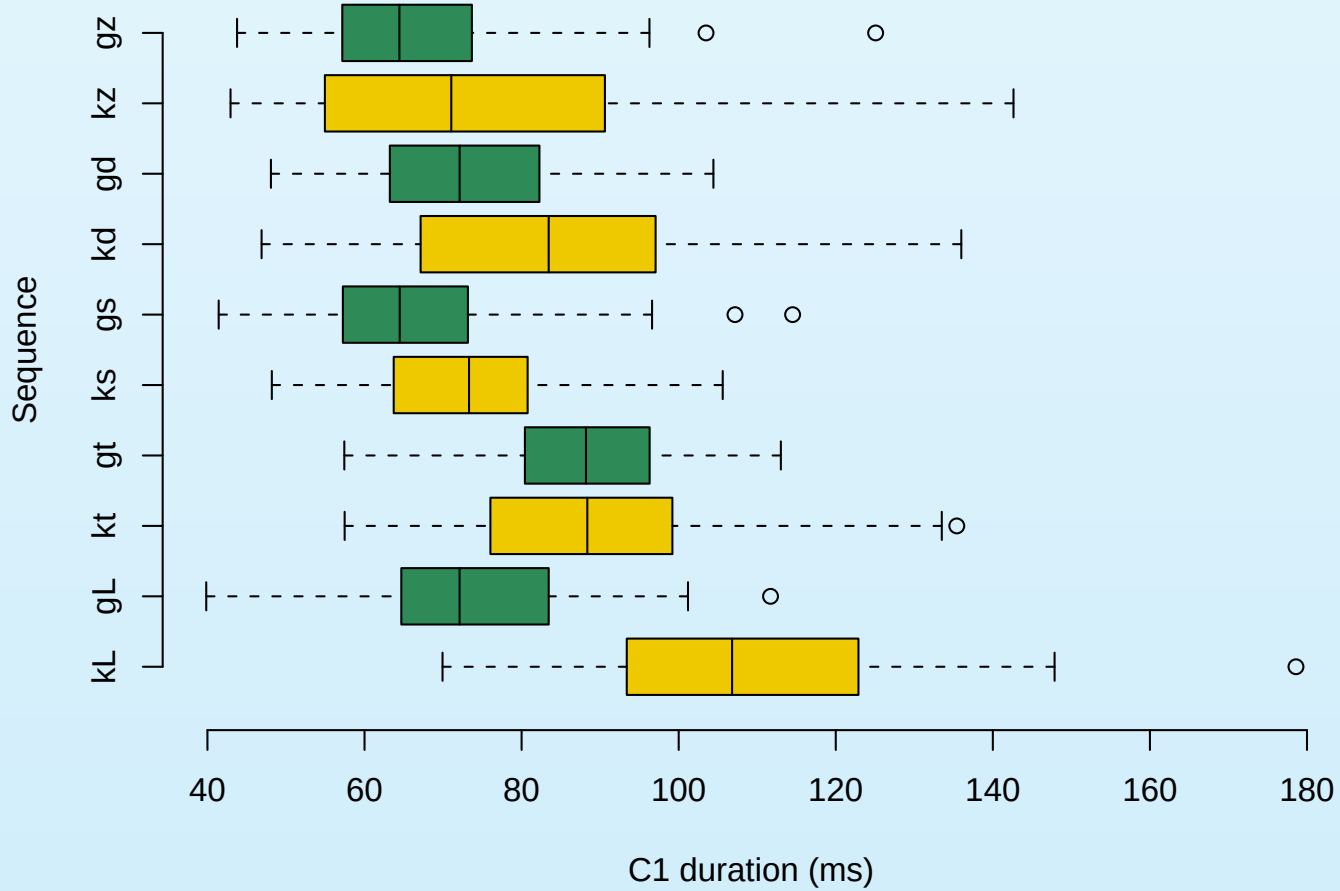
- As part of a larger set of experiments, 4 native speakers of Hungarian produced two–way consonant clusters from written stimuli
- C_1–C_2 sequences were embedded at subject noun–verb boundaries in carrier sentences:

  $\mathbf{C}_1$ = /k, g/
  $\mathbf{C}_2$ = /t, d, s, z, L(iquid)/
- C_1C_2 sequences realised with an internal pause and unsegementable sequences were excluded from subsequent analysis

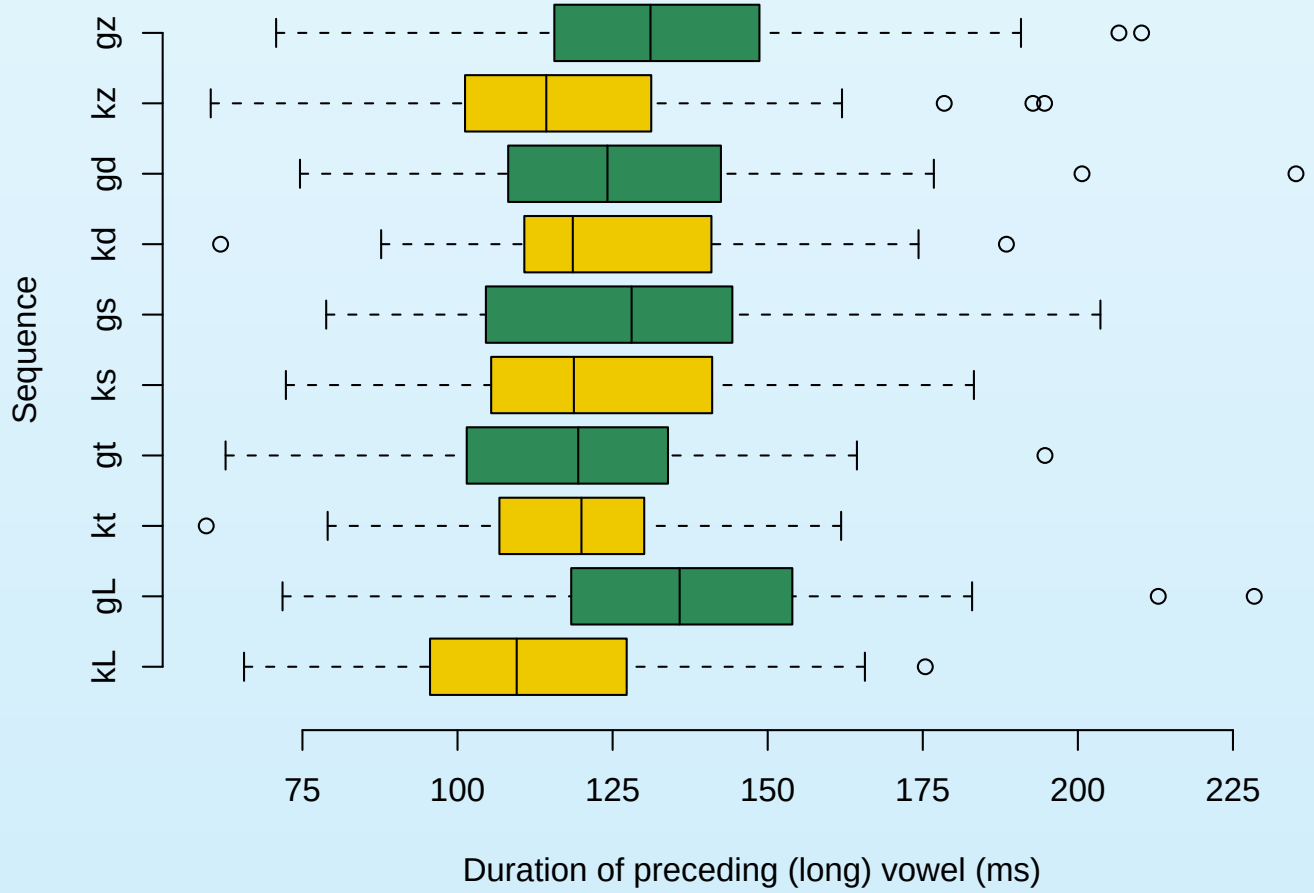
Experiment 1: results



Experiment 1: results



Experiment 1: results



Experiment 1: results

- Means for C_1 voicing, duration, and preceding vowel duration (all in ms):

C_1C_2	C_1 voicing	C_1 duration	N	V. duration	N
/g/ + /z/	64	67	72	135	37
/k/ + /z/	46	76	63	121	33
/g/ + /d/	70	73	67	129	39
/k/ + /d/	53	83	62	125	29
/g/ + /s/	31	66	70	128	35
/k/ + /s/	28	73	66	123	35
/g/ + /t/	31	88	71	119	36
/k/ + /t/	27	89	64	118	32
/g/ + /L/	65	73	70	139	35
/k/ + /L/	32	109	67	114	35

Experiment 1: results

- In the baseline environment, Hungarian /k, g/ seem to be distinguished by means of voicing, duration, and preceding vowel duration
- As expected, these phonetic distinctions are mostly (near–)neutralised in pre–obstruent contexts
- There is evidence of incomplete neutralisation of C_1 voicing distinctions before a [+voice] C_2

Experiment 2

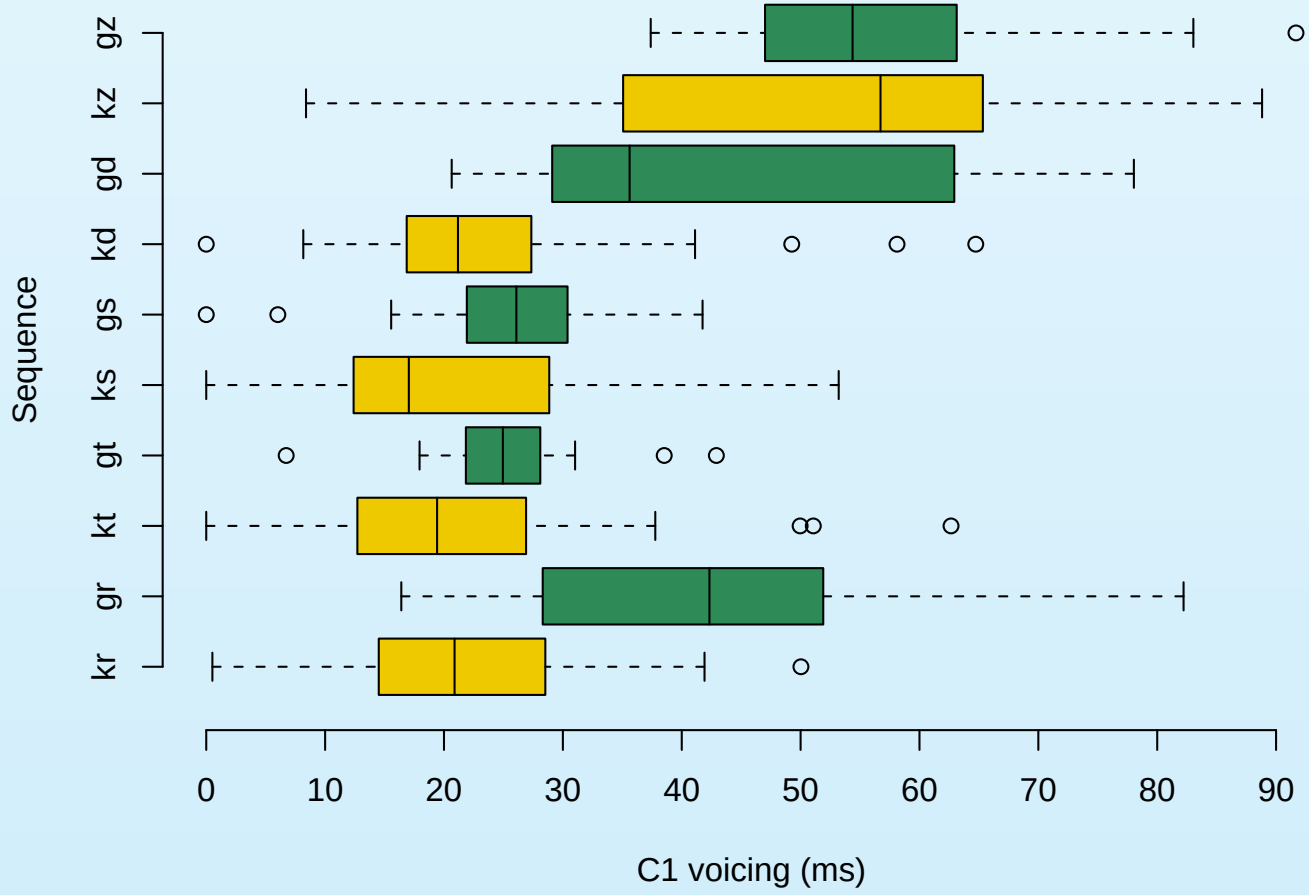
- Generative typologies of laryngeal phonology tend to cast (most varieties of) English as a language without RVA (under word sandhi: Lombardi (1999); Iverson & Salmons (1999))
- Standard phonetic descriptions note 'phonetic' devoicing before [-voice] obstruents, affecting [+voice] fricatives (of weak forms) in particular (e.g., Gimson 1994

Experiment 2

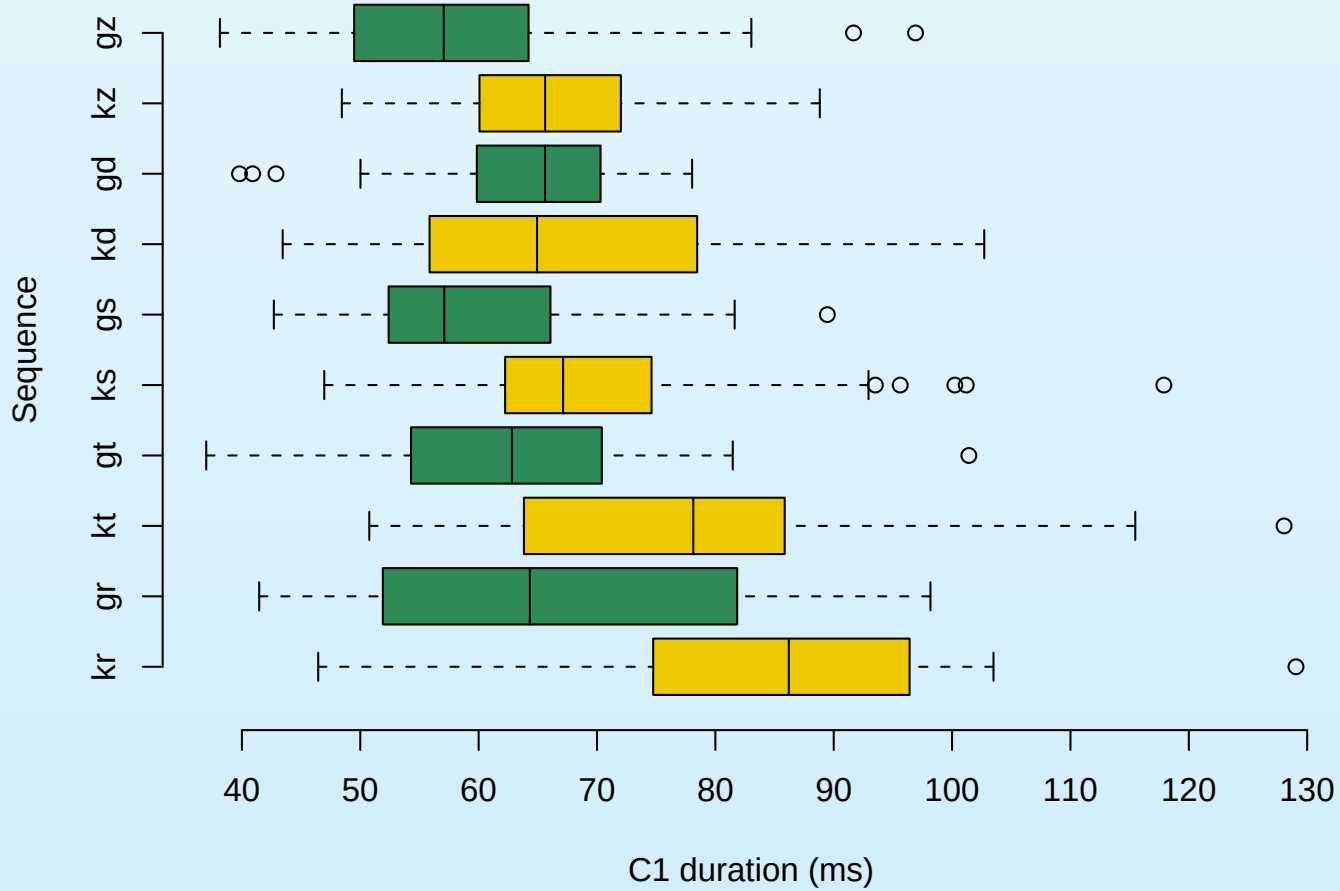
- As part of a larger set of experiments, 4 native speakers of SB varieties of English produced two–way consonant clusters from written stimuli
- C_1–C_2 sequences were embedded at adjective–stressed noun boundaries in carrier sentences:

  $\mathbf{C}_1$ = /k, g/
  $\mathbf{C}_2$ = /t, d, s, z, r/
- C_1C_2 sequences realised with an internal pause and unsegementable sequences were excluded from subsequent analysis

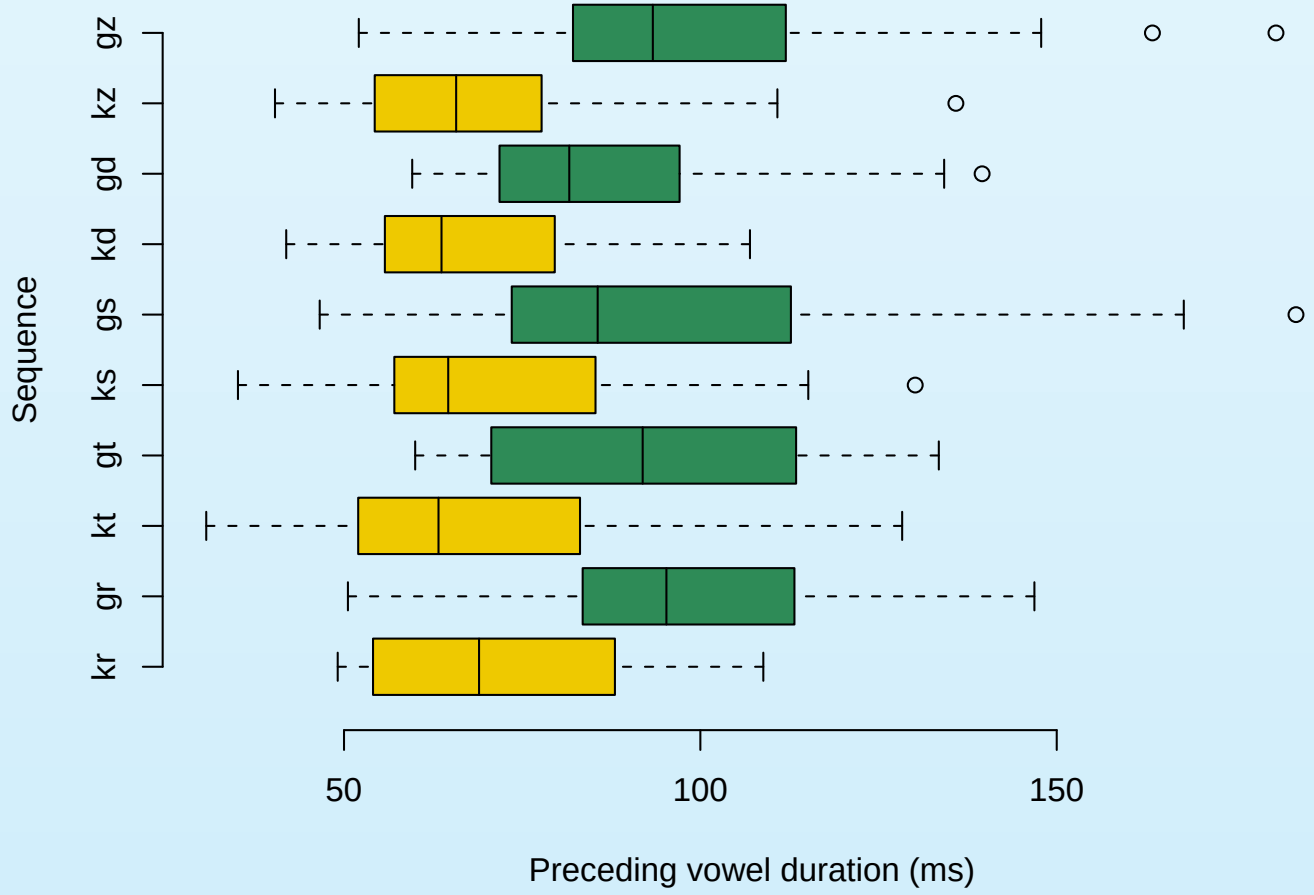
Experiment 2: results



Experiment 2: results



Experiment 2: results



Experiment 2: results

- Means for C_1 voicing, duration, and preceding vowel duration:

C_1C_2	C_1 voicing	C_1 duration	V. duration	N
/g/ + /z/	56	58	100	47
/k/ + /z/	51	67	68	36
/g/ + /d/	43	62	89	18
/k/ + /d/	25	68	68	26
/g/ + /s/	26	60	98	45
/k/ + /s/	21	70	71	47
/g/ + /t/	25	63	93	26
/k/ + /t/	22	79	69	31
/g/ + /r/	42	66	99	47
/k/ + /r/	22	84	72	32

Experiment 2: results

- As expected, the English speakers exhibit phonetic devoicing in pre–[-voice] contexts
- Perhaps more surprisingly, the English speakers also exhibit some RVA before /z/ but not before /d/
- The absence of any assimilatory effects on the duration of the preceding vowel, on the other hand, is in accordance with phonetic descriptions of (the relevant varieties of) English

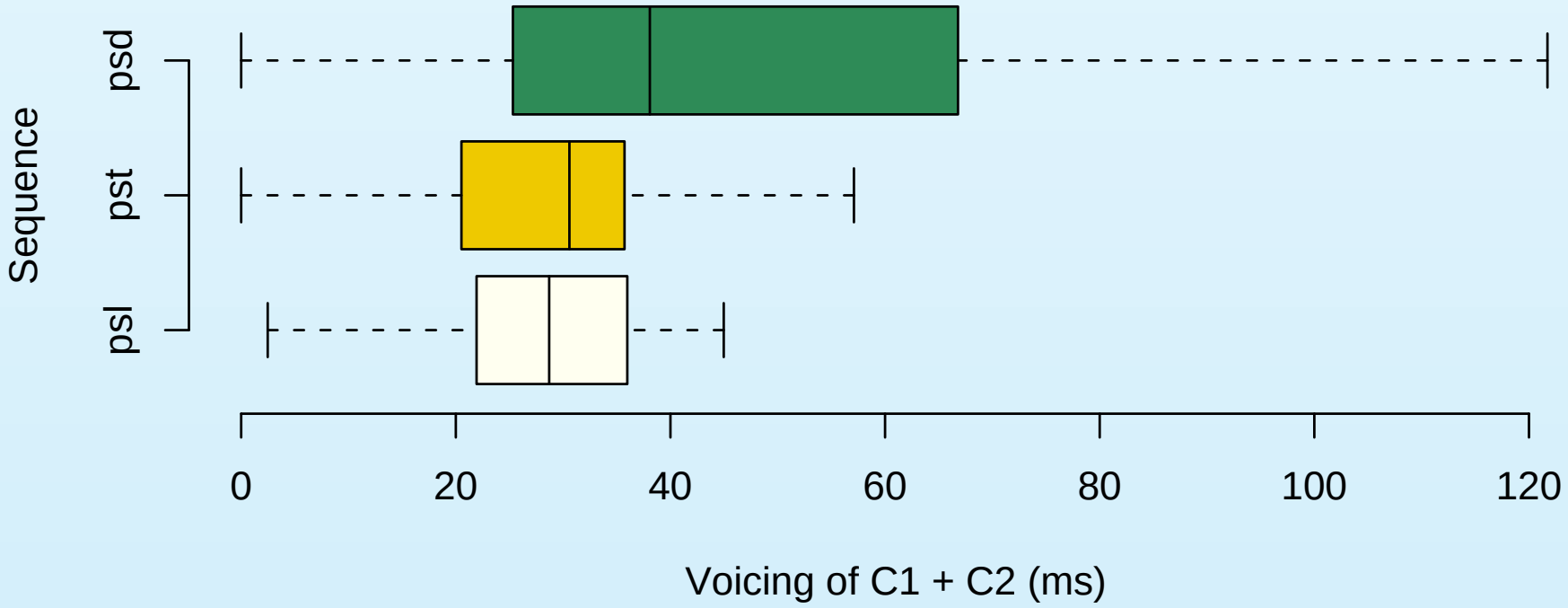
Experiment 3

- As part of a larger set of experiments, 4 native speakers of Hungarian were asked to produce the following consonant clusters from written stimuli:

  1. /ps # d/
  2. /ps # t/
  3. /ps # l/

- Stimulus design and experimental conditions were as per Experiment 1

Experiment 3: results



Experiment 3: results

- Means for C_1 + C_2 voicing, duration and preceding vowel duration (all in ms):

$C_1C_2C_3$	Voicing	Duration	V. duration	N
/psd/	45	136	76	47
/pst/	28	143	68	53
/psl/	29	146	69	52

Experiment 4

- Dutch is well known for neutralising the opposition between [+voice] and [-voice] obstruents word–finally:

UR	Plural	Citation	diminutive	Gloss
/xrɑp/	[χrɑpən]	[χrɑp]	[χrɑpjə]	joke
/krɑb/	[krɑbən]	[krɑp]	[krɑpjə]	crab
/ɣraːt/	[χraːtən]	[χraːt]	[χraːtjə]	fishbone
/ɣraːd/	[χraːdən]	[χraːt]	[χraːtjə]	degree

Experiment 4

- In addition, Dutch tends to voice final obstruents followed by a [+voice] plosive:

UR	Phonetic form	Gloss
/ʊeːk/ + /diːr/	[ʊeʲːgdiɹ]	mollusc
/zɑnd/ + /bɑnk/	[zɑndbɑnk]	sand bank
/vɪs/ + /diːfjə/	[vɪzdifjə]	common tern
/rɛiz/ + /duːl/	[rɛizdul]	destination

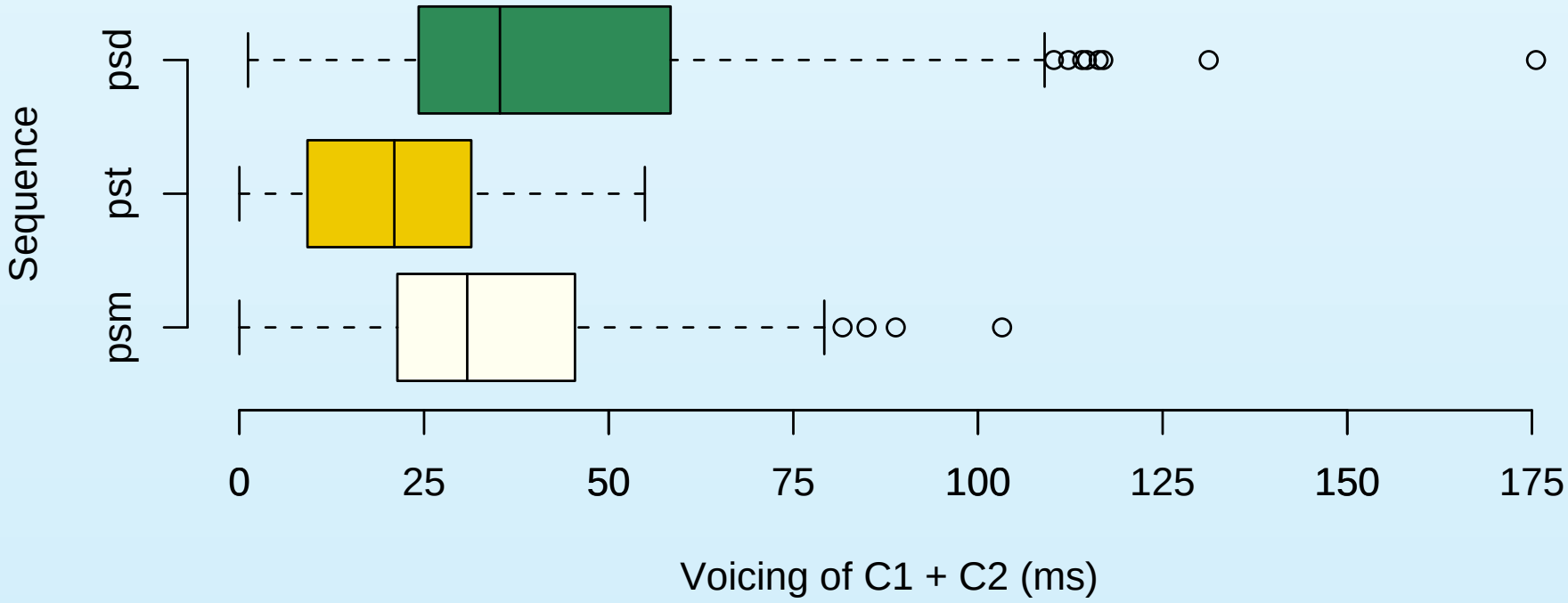
Experiment 4

- As part of a larger set of experiments, 4 native speakers of Dutch produced the following consonant $C_1C + {}_2 + C_3$ clusters from written stimuli:

  1. /ps # d/
  2. /ps # t/
  3. /ps # m/

- Stimuli consisted of /p/–final stems + possessive/adjectival /s/ followed by a stressed noun carrying C_3C

Experiment 4: results



Experiment 4: results

- Means for C_1 + C_2 voicing, duration and preceding vowel duration (all in ms):

$C_1C_2C_3$	Voicing	Duration	V. duration	N
/psd/	46	119	93	116
/pst/	21	146	93	116
/psm/	34	129	91	114

Experiment 3/4: results

- The Hungarian results are unremarkable: /ps/ assimilates to a following /d/ but is shows baseline behaviour before /t/, which seems to confirm the intuition that assimilation in (lexical) [-voice][-voice] sequences is necessarily vacuous.
- However, the Dutch material appears to show a tripartite pattern whereby /ps/ assimilates to both /t/ and d, and thus does seem to show assimilation in what most phonologists would analyse as a [-voice] + [-voice] sequence
- or, on an alternative interpretation, /ps/ assimilates to both /d/ and /m/

Discussion

- Voicing assimilation is the stock material of introductory phonology texts, and is typically cast as one or more of the following:
  - Uniform across languages and grammatical contexts: the same (binary feature value–swapping) rule template applied in most circumstances
  - Manner symmetric: laryngeal structure is typically assumed to be identical for plosives and fricatives
  - [voice] symmetric or [+voice]-dominant asymmetric
  - Categorical: obstruents acquiring [αvoice] by assimilation are identical to underlyingly [αvoice] sounds

Discussion

- The current work contributes to a growing body of evidence (also see, e.g., Burton & Robblee (1997); Barry & Teifour (1999)) for a richer and more complex concept of VA as (potentially):
  - Heterogeneous across languages/environments
  - Asymmetric with regard to manner (English /z/ vs. /d/ and to [voice] (incomplete neutralisation before Hungarian [+voice] obstruents)
  - Non–categorical (Hungarian) or even cue–specific (English)
  - Applicable in neutralised + underlying [-voice] sequences (Dutch)

References

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